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NORTH AMERICAN LEPTOTHORAX OF THE TRICARINATUS-TEXANUS COMPLEX (HYMENOPTERA: FORMICIDÆ)

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One of the least known groups of our North American *Leptothorax*, subgenus *Myrafant*, are the closely related forms belonging to the *tricarinatus*-*texanus* complex. This group includes forms recently treated by Creighton (April 1950) in his "Ants of North America" under the names *texanus texanus* Wheeler, *texanus davisii* Wheeler, *tricarinatus tricarinatus* Emery, *tricarinatus neomexicanus* Wheeler. These ants are in general characterized by their 12-segmented antenna, scape commonly failing by its greatest breadth to reach the posterior border of the head, thorax without mesoepinotal constriction, clypeus with a longitudinally rugulose shield or plate at the middle of its anterior border, extraordinarily large and broad postpetiolar node, and rather abundant, coarse, grayish or whitish, suberect to erect body hairs. So far as is known, all forms live in small colonies within the soil. Their food is probably largely, if not exclusively, the flesh of small arthropods.

L. tricarinatus tricarinatus is the oldest form. It was inadequately described by Emery in 1895 from a holotype worker collected at Hill City, South Dakota, by Titus Ulke. As the type was deposited in the collection of Emery in Europe, apparently no American workers have ever seen it. When Wheeler revised the North American forms of *Leptothorax* in 1903, he therefore had to base his key and description of *tricarinatus* entirely on literature. Apparently Creighton also did not see the holotype or any specimen from the original nest when he published the section of *Leptothorax* in his book on ants referred to above. I have been more fortunate than Wheeler and Creighton in being able to examine not only a worker from the original nest series (in the collection of the United States National Museum) but also

Leptothorax (Myrafant) *tricarinatus tricarinatus* Emery

Leptothorax (*Leptothorax*) *tricarinatus* Emery, 1895, Zool. Jahrb. Abt. f. System. 8: 318, 321-322. ♂.—Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 223, 247-248. ♀. (Pl. 12, fig. 17, ♀).—Wheeler, 1909, Jour. N. Y. Ent. Soc. 17: 82. ♀.—Buren, 1944, Iowa State Col. Jour. Sci. 18: 286, 288. ♂.—Creighton, 1950, Harvard Univ., Bul. Mus. Compar. Zool. 104: 257, 273. ♂♀.

WORKER.—Length 2-2.6 mm.

Head subrectangular, distinctly longer than broad, with almost straight posterior border, rounded posterior corners and weakly convex, somewhat subparallel sides. Antenna 12-segmented; scape lacking approximately its greatest width of reaching the posterior border of the head; funiculus with a distinct 3-segmented club, the last segment of which is clearly longer than the combined lengths of the two preceding segments; first funicular segment approximately as long as the three succeeding segments. Eye oval, rather prominent, situated approximately its greatest length from the base of the mandible. Clypeus with a distinct shield or plate at the middle of its anterior border, which usually bears a distinct median and two lateral, longitudinal carinae; each side of the shield commonly bearing a number of smaller and less distinct longitudinal carinae. Frontal area poorly defined or obsolescent. Mandible of the usual shape, with five teeth, of which the apical is the largest. Thorax in profile, moderately convex; from above, widest at the well-rounded prothoracic humeri, narrowest laterally in the region of the mesoepinotum, dorsal surface without sutures or a mesoepinotal impression. Epinotum bearing a pair of short, dentiform or tuberculiform spines. Dorsal portion of petiolar node in profile forming an obtuse angle or else a weakly developed subrectangle. Postpetiolar node from above, large, transverse, but not twice as wide as the petiolar node; approximately $1\frac{1}{2}$ times as broad as long, with almost straight anterior border, rounded anterior shoulders and weakly convex, somewhat subparallel sides. Gaster from above, oval, with angular humeri.

Head, thorax, petiole and postpetiole subopaque or opaque; clypeal shield, frontal area and gaster rather smooth and shining. Mandible longitudinally striated, the surface bearing scattered, piligerous punctures. Dorsal surface of head largely punctate or granulate, but also with a number of delicate rugulae extending from the clypeus toward the occiput; cheek, and region between the eye and the frontal carina largely rugulose or rugulose-reticulate. Dorsum of thorax distinctly but not extraordinarily coarsely rugulose or rugulose-reticulate, the sculpturing usually less coarse on the mesonotum than on the pronotum and epinotum. Petiolar node rugulose-reticulate. Postpetiolar node usually finely punctulate or granulate, occasionally finely rugulose-reticulate in addition.

Body with rather abundant, well scattered, coarse, grayish or whitish, suberect to erect hairs. Hairs on the leg similarly colored but smaller and

more appressed; coxa, trochanter and femur with a few scattered, suberect to erect hairs. Scape with fine, rather dense, appressed pubescence. Pubescence of gaster composed of distinct but sparse, well scattered, appressed pile.

Dark brown to brownish black but not jet black; mandible, base of each funiculus, pronotal collar, apex of coxa, trochanter, base of femur, tibia and articulations of leg lighter.

MALE.—Length 1.8–2 mm.

Head, including eyes, broader than long, with rounded posterior border and rounded posterior angles. Eye large, strongly convex, protuberant, situated approximately one-fourth its length from the base of the mandible. Ocelli small, arranged in a triangle on the vertex of the head but scarcely protruding above the general surface of the head. Clypeus convex in the middle, lacking the characteristic shield or plate of the worker. Mandible rather small, subtriangular, with an apical and several less distinct teeth. Antenna 13-segmented; last 4 funicular segments forming a well defined club, the apical segment of which is longer than the combined length of the 2 preceding segments; scape rather stout and short but longer than the space between the frontal carinae; first funicular segment pyriform. Mayrian furrows lacking or obsolete on the thorax, the parapsidal sutures present but not easily discernible. Anterior wing pale grayish or whitish; veins pale and rather indistinct, usually forming a closed cubital and a discoidal cell, the discoidal cell however sometimes poorly developed or lacking; stigma well developed but indistinct because of its pale color. Epinotum in profile, subangular, bearing a pair of weak longitudinal carinae or else a pair of indistinct tooth-like protuberances. Leg rather long and slender, with slightly enlarged femur and tibia. Postpetiolar node from above, subcampanulate, not twice as wide as the petiolar node. Gaster from the same aspect, oval. Stipes stout, bluntly subtriangular.

Much of the body with finely punctulate or granulate sculpturing; scutellum, mesopleuron, dorsal surface of petiolar and postpetiolar nodes and gaster, smooth and shining.

Pilosity similar to that of the worker but apparently not so abundant, long or coarse.

Color similar to that of the worker but even darker; the mandible, pronotal collar and articulations of the leg not as light or as contrastingly marked.

Type locality—Hill City, South Dakota, Titus Ulke collector (not Theodore Pergande as stated in other publications).

This form has been redescribed from a specimen from the original nest series as well as specimens from various localities mentioned below:

Colorado: Greeley, W. J. Zaunmeyer; .8 miles west of La Junta, V. E. Romney. Iowa: Inwood and Oak Grove State Park, Wm. F. Buren; Sioux City, C. N. Ainslie. South Dakota: Canning,

Walker, Meckling, Philip, Cottonwood, Wall and Interior of the Badlands, Presho, Lemmon, Chamberlain, Eagle Butte, Fort Pierce, Reva Alkali Flats, Kenebec, Highmore, all collected by H. C. Severin; Hayes, V. G. Davidson. Utah: 20 miles southwest of Nephi, R. W. Fautin.

In addition to the general characters given for the group on page , and those mentioned in the key, the worker possesses a dark brown to brownish black body with contrasting lighter areas as described above. Workers vary considerable in size, development of the epinotal spines, shape of the petiolar node, and sculpturing, especially the sculpturing of the clypeal shield, thorax and postpetiolar node.

Unlike the worker, the male has few good characters that will help to distinguish it. Probably the best are its rather uniformly sculptured, finely granulate or punctulate body, pale anterior wing with indistinct veins which usually form a closed cubital and discoidal cell, and the subcampanulate postpetiolar node, the dorsal surface of which is usually shining.

The male varies in size, venation of wings, sculpturing, and shape of the epinotum. There is little information available on the biology of *tricarinatus tricarinatus*. Buren records the form as nesting in the ground in small colonies in at least two localities in Iowa. Severin in South Dakota has collected specimens from alkali flats and the Badlands. He has also taken individuals while sweeping various grasses and weeds at Canning. At Greeley, Colorado, the ants were collected from a bean field, and at La Junta from a region bearing the Russian thistle, *Salsola pestifer* Nels. The food of the workers is not known, but it probably comprises small arthropods supplemented by honeydew. In South Dakota males have been collected in various localities from July 26 to September 14.

Leptothorax (Myrafant) *tricarinatus neomexicanus* Wheeler

Leptothorax neomexicanus Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 223, 248-249. ♂. (Pl. 12, fig. 18, ♂).—Wheeler, 1906, Bul. Amer. Mus. Nat. Hist. 22: 341.—Creighton, 1950, Harvard Univ., Bul. Mus. Compar. Zool. 104: 256, 273. ♂ ♀. I have checked a cotype worker against Wheeler's original de-

scription and it failed to agree with the description in the following respects: The scape does not extend a distance equal to its greatest width beyond the posterior angle of the head as stated by Wheeler (the scape of my specimen scarcely attains the posterior angle of the head much less surpasses it). Wheeler remarked that the humeri of the thorax are rounded, whereas in my specimen the transverse pronotal carina seems to meet each humerus in a very faint but perceptible angle. He also recorded the sides of the petiole as "somewhat convex" when to me they appear to be practically straight. The postpetiole is stated to be nearly as long as broad, subglobular, but as a matter of fact it is distinctly broader than long and nearly subrectangular. The original color was described as black, and this may have been the case, but the specimen I examined was nearly uniform brown, with the mandibles, terminal portions of the femora and tibiae and all of the tarsal segments except the last, yellowish, as given by Wheeler.

L. tricarinatus neomexicanus can be readily distinguished from the other forms by the very short, dentiform or tuberculiform spines of the epinotum and by the nature of the body sculpturing. The dorsal surface of the head, thorax, petiole and postpetiole is largely and more or less uniformly covered with a granulate or punctulate sculpture which is so delicate that much of these body areas, especially the head and thorax, are shining in certain lights.

The worker varies considerably in size and sculpture. Smallest workers are approximately 2 mm. in length and largest workers 2.5 mm. The sculpturing on the head and thorax is highly variable, so much so, that on some specimens much of these areas are highly glabrous. Occasionally there are smooth areas practically devoid of sculpture.

Type locality.—Manzanares, New Mexico, Mary Cooper.

The fore-going remarks are based on a single cotype worker and also on the number of workers indicated by parentheses after the localities listed below:

Arizona: Kohonino Forest on the rim of the Grand Canyon (3), W. M. Wheeler. New Mexico: Ingan Mts. (1), C. N. Ainslie. Utah: White Valley in Millard County (4), R. W. Fautin.

The biology of this form is the least known of any member of

the group. The only available notes are those by Wheeler concerning the original specimens, which he states that he found living as a small colony beneath a stone in the Kohonino Forest on the rim of the Grand Canyon. Wheeler considered the ants living in this location as typical of the Rocky Mountain fauna of the same or similar altitudes (6,000–8,000 feet). The specimens collected in White Valley, Millard County, Utah, are from an arid, desert type of country.

Leptothorax (Myrafant) *texanus texanus* Wheeler

Leptothorax texanus Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 223, 245–247, ♀ ♀ ♂. (Pl. 12, fig. 16 ♀.)—Smith, 1932, Ent. News 43: 160. ♀.—Talbot, 1934, Ecol. 15: 420.—Wesson and Wesson, 1940, Amer. Midl. Nat. 24: 98.—Gregg, 1944, Ann. Ent. Soc. Amer. 37: 456, 466–467. ♀.—Gregg, 1946, Amer. Midl. Nat. 35: 748.—Creighton, 1950, Harvard Univ., Bul. Mus. Compar. Zool. 104: 256, 272. ♀ ♀.

Wheeler's original description very well fits the specimens examined by me. However, I cannot agree with his statements that the outline of the postpetiole from above is subelliptical and that the postpetiole is fully twice as broad as the petiole. In my specimens the postpetiole is slightly less than twice as wide as the petiole.

L. texanus texanus is very closely related to *texanus davisii* and on superficial appearances the two forms might easily be confused. The most dependable character for separating them is the sculpturing of the postpetiolar node which in *texanus* is roughly rugulose-reticulate whereas in *davisii* it is finely granulate or punctulate. The thoracic dorsum of *texanus* is usually more roughly sculptured and therefore more opaque or sub-opaque but in certain individuals this character is variable and therefore cannot be fully relied upon. The specimens examined varied in size from 2.25 to 2.8 mm.

Like *Davisii*, *texanus* varies considerably in size, sculpture and in the proportions of the postpetiolar node. All the specimens I have seen have distinct epinotal spines, but it is possible that on occasions they are small enough in certain individuals to be confused with those termed dentiform or tuberculiform.

Type locality.—Milano in Milam County, Texas, W. M. Wheeler (not in Millan County as cited by Wheeler).

Specimens studied; two worker cotypes, and also the number of workers indicated in parentheses after the localities listed below:

Alabama: Peterson in Tuscaloosa County (2), Edward O. Wilson, Jr. Illinois: Momence (2), Robert E. Gregg. Indiana: Ogden (2), Mary Talbot. Louisiana: DeRidder (3), Wm. F. Buren. Michigan: Indian River in Cheboygan County, C. H. Kennedy; Flat Rock (1), Houghton Lake State Park (1), and Douglas Lake (22), Mary Talbot. Minnesota: Hunter's Hill (1), Duluth, A. Wiljamaa. Mississippi: Louisville, M. R. Smith; Ripley, S. W. Simmons. Missouri: Columbia (1), Mary Talbot. North Carolina: Pilot Mt. in Wayne County (1), D. L. Wray. Ohio: Holland (3), Mary Talbot. Oklahoma: Wichita Natl. Forest, Harmon and Latimer Counties, W. Fisher.

Although this form has been collected over a wider range and more often than any other member of the complex, the records from most States have been based on a few stray specimens rather than on collections of numerous colonies. From the data obtained it appears that *texanus texanus* forms small colonies in shallow nests in the soil. Most of the soils from which it has been reported are sandy or sandy loams. Mary Talbot, however, reports that she collected workers from a clay loam soil at Columbia, Missouri, and D. L. Wray collected the form from a reddish clay soil in North Carolina at an altitude of 1100 feet. Kennedy stated that he secured a colony from a clump of grass roots in Michigan, but he did not make it clear whether the ants were nesting in the soil around the grass or in the grass roots themselves. The form appears adapted to nesting in the soil openly or else under cover of trees and perhaps other vegetation. Edward O. Wilson, Jr., collected specimens from an open mixed woods and this has been my experience also. *Texanus texanus* seems well adapted to and highly characteristic of the sand dunes of Illinois and Indiana. Some of the best notes I have on the form are from Mary Talbot, which are herewith quoted verbatim. "In Ohio, *L. texanus* has been taken at the 'Oak Openings.' This is a remarkable area of sandy soil lying principally in the western part of Lucas County (northwest of Toledo). The 'Oak

Openings' territory represents the western extremity of ancient Lake Warren, a glacial lake which preceded Lake Erie. It is characterized by sandy ridges alternating with low marshy strips of prairie on which grow many plants rare or lacking in the rest of the State. The commonest oaks are the black oaks, *Quercus velutina* Lem., and white oak, *Q. alba* L. Abundant, characteristic plants are bracken fern, *Pteris aquilina* L., black blueberry, *Vaccinium atrococcum* Gray, blazing star, *Liatris scariosa* Willd., false foxglove, *Gerardia virginica* L., showy puccoon, *Lithospermum gmelini* Mich. The environment in which the ants were found was a sandy ridge sparsely covered by small black oaks. There was much open sand with scattered clumps of grass, bergamot, blazing star, lupine, blueberry. A nest found consisted of a few cells at the intertwining roots of a clump of grass just beneath a scum-like moss which grows in little clumps on the sand. At this same grass roots was a nest of *Paratrechina parvula*, another ant which in the north tends to be restricted to sandy places.

"Other collection records of *texanus* show it living in habitats remarkably similar to this one. In Michigan it was taken at Flat Rock on an oak ridge of sand in which grew bracken, blueberry and little mounds of moss and once in Rosecommon County in an open oak-pine sand woods around clumps of bracken, sweet fern, and scums of dry moss. In northern Indiana it has been found in the pine dunes and the black oak dunes. Here again it was in fairly open sand and the nest was found just under the surface covered by a little moss. Again the colony chanced to be near that of a *Paratrechina parvula* nest. Here it was found that the ants form definite, though invisible, trails across the sand and moss. These trails are loose and only two or three ants are commonly seen at one time but each follows exactly the same pattern."

Males have been collected in Texas in late May, in Ohio in early July and in Michigan in late July.

Leptothorax (Myrafant) *texanus davisii* Wheeler

Leptothorax texanus davisii Wheeler, 1905, Bul. Amer. Mus. Nat. Hist. 21: 385. ♂ ♀.—Sturtevant, 1931, Psyche 38: 75.—

Creighton, 1950, Harvard Univ., Bul. Mus. Compar. Zool. 104: 257, 272-273. ♂ ♀.

This form is characterized by the petiolar node which when seen in profile is thick anteroposteriorly with the dorsal surface meeting the anterior and posterior surface in such a manner as to form somewhat of a distinct subrectangle; the extraordinarily large and broad postpetiolar node which is approximately $1\frac{1}{3}$ to $1\frac{1}{2}$ times as broad as long, with the dorsal surface of the node finely granulate or punctulate; epinotum bearing a pair of spines which infrequently are small enough to be confused with those termed dentiform or tuberculiform; sculpturing of the thorax generally weaker than that of *texanus texanus* so that part, or most of the surface in some lights at least, has a glabrous appearance.

Workers examined varied in size from 2.2 to 2.5 mm. in length. The sculpture of the body is quite variable, especially on the clypeal shield and on the dorsum of the thorax. The epinotal spines are also variable in length as mentioned above.

Type locality.—Lakehurst, New Jersey, W. M. Wheeler.

The above remarks are based on three cotype workers and five topotype workers and also on the number of workers indicated in parentheses under the localities listed below:

Florida: University of Florida Conservation Reserve, Welaka in Putnam County (5), Arnold Van Pelt. Massachusetts: South Wellfleet, A. H. Sturtevant. New York: Mattuck (1), Flanders (1), Greenport (2), Long Island, all collected by Roy Latham.

The biology of *texanus davis*i is very poorly known. Wheeler (1905, p. 385) remarked as follows concerning the type series: "Like the Texan form, *davis*i nests in pure white sand, forming slender galleries a few inches in length. It moves about rather slowly on the sunlit surface of the sand in search of small insects." Concerning the Massachusetts individuals Sturtevant (1931, p. 75) stated "One nest, in white sand." With regard to the ants collected in the University of Florida Conservation Reserve at Welaka, Arnold Van Pelt wrote me as follows: "*davis*i shows a preference for the higher, drier areas of the Reserve, but it was not taken abundantly in any plant association. On many of the occasions I collected it, several individuals were

grouped together, probably resting, and there was no indication of a nest. All of these were in the sand which contained only a thin layer of organic matter on the surface, below which the soil was a fine sand. The areas in which it occurred were always relatively open, but in some areas, such as the *Quercus laevis-Pinus palustris* association (turkey oak sandhills), there is shade for at least part of every day. The largest nest I was able to find contained 18 workers and a queen, with no immatures. This nest seemed to have no apparent opening to the surface, and the whole nest was within one-quarter inch of the surface in the sand. Other nests were under light litter."